

Memorandum

To: Mark Dietrich, Regional Administrator
John Kirkpatrick, Engineering Manager

From: Tom Hepworth

Date: May 20, 2005

Re: Staff Analysis for the *Draft* Wastewater-Land Application Permit, WLAP #LA-000171-02
for the Wada Farms Potatoes, Inc.

Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 16.01.17.400.04 (Wastewater-Land Application Permit Regulations) for issuing wastewater land application permits (WLAP). It states the principal facts and significant questions considered in preparing the draft permit conditions and provides a summary of the basis for the draft permit. The analysis references applicable requirements and supporting materials as appropriate.

Executive Summary

Wada Farms Potatoes, Inc has requested renewal of #LA-000171-02, a wastewater-land application permit that has authorized the company's use of property in the Pingree area for the beneficial reuse of industrial wastewater from their potato fresh pack plant.

The Wada Farms facility conducts fresh pack operations only; potato processing operations are limited to washing, conveyance and packaging.

The Wada Farms wastewater-land application system has historically been operated at low volumes and constituent strength. However, there have been instances of permit non-compliance in the past. Specifically system operators have applied industrial wastewater to unpermitted acreage.

The following technical analysis demonstrates that the Permittee has increased wastewater treatment capacity via the addition of 28 acres of agricultural acreage (irrigated pasture). The land treatment base under #LA-000171-02 will consist of 138 acres.

The addition of the irrigated pasture to the permit brings additional flexibility to the wastewater-land application operation and mitigates the potential for permit non-compliance.

Staff recommends the issuance of #LA-000171-02, as attached.

Table of Contents

Purpose.....	1
Executive Summary	1
Staff Report.....	2
1. Summary of Events	2
2. Process Description.....	3
3. Discussion.....	3
3.1. Site Conditions and Treatment Processes.....	3
3.2. Soils: Description, Data Evaluation, Monitoring	5
3.3. Ground Water Quality Monitoring	5
3.4. Nuisance Odor Management.....	9
3.5. Environmental Monitoring	9
3.6. Compliance Requirements.....	9
4. Conclusions and Recommendations.....	10
List of References.....	10

Staff Report

1. Summary of Events

August 25, 1997 – Idaho DEQ received an application for a WLAP permit.

October 22, 1997 – Bingham County issued a Special Use Permit for the Wada Farms wastewater-land application operation.

December 12, 1997 – Idaho DEQ issued WLAP #LA-000171-01 to Wada Farms Potatoes, Inc. with an expiration date of December 12, 2002.

February 27, 2001 – Idaho DEQ provided written notification to Wada Farms of failure to submit annual reports as required in #LA-000171-01 for the operating years 1999 and 2000.

August 8, 2001 – Idaho DEQ received annual reports for the 1999 and 2000 operating years. The annual reports indicated non-compliance with terms and conditions of the permit (inadequate monitoring and sampling, constituent loading for nitrogen and phosphorus exceeded permit limits, past due compliance requirements). The 2001 Annual Report included an updated mixing zone analysis pursuant to CA-171-02 (originally due August 1998).

April 23, 2002 – Idaho DEQ held a compliance conference with Wada Farms to discuss monitoring and reporting requirements, hydraulic and constituent limit exceedances, and the status of permit compliance requirements.

August 30, 2002 – Wada Farms submitted results of a 15-day seepage test for the mixing pond (originally due August 1998).

October 23, 2002 – Wada Farms provided written notification to DEQ that wastewater had been applied to a pasture not included in #LA-00171-01 as a permitted hydraulic management unit.

November 11, 2002 – Wada Farms submitted a Preliminary Permit Application for renewal of #LA-000171.

June 11, 2003 – Wada Farms submitted a “Site Characterization and Management Plan” and an “Operations Plan for Land Application of Potato Fresh Pack Wash Water on Crops” (Operations Plan submitted pursuant to CA-171-03, originally due 12/15/98).

November 5, 2003 – Wada Farms submitted an “Addendum to Permit Application for Wada Farms Potatoes, Pingree, Wastewater Land Application Program Permit #LA-000171-01.

May 20, 2005 - Idaho DEQ issued a completeness determination and a draft permit for #LA-000171-02.

2. Process Description

Wada Farms Potatoes, Inc. is a potato fresh pack operation located approximately 3 miles north of Pingree on State Highway 39. The facility was constructed in 1998 to wash package fresh potatoes year-round and receives fresh packaging-grade potatoes by truck throughout the year. Potatoes are premium quality and intended for direct consumption. Aside from washing and sorting, no further processing occurs at the Wada Farms plant. Washing and sorting operations generate relatively low strength industrial wastewater containing mostly soil residue with small quantities of total Kjeldahl nitrogen (TKN), nitrate + nitrite, total phosphorus (P), chemical oxygen demand (COD), electrical conductivity (EC), total dissolved solids (TDS), volatile dissolved solids (VDS) and non-volatile dissolved solids (NVDS).

Process water receives primary clarification via 3 in-series cyclone-type clarifiers for mud separation and removal. Clarifier underflow solids are removed by a contractor and disposed at an off-site pumpable waste treatment facility. The pumpable waste treatment facility is operated under separate approvals issued by Idaho DEQ (Site Approval) and the Southeastern District Health Department (Operations Approval).

Following clarification, process water is pumped approximately 1,700 feet through a 4 inch diameter, PVC pipeline to a storage/mixing pond. The mixing pond is also used to receive and store canal water for supplemental irrigation. From the mixing pond, any combination of process and fresh water can be delivered to the land treatment fields. These include three (3) designated hydraulic management units. Irrigation is accomplished via hand lines and one center pivot.

3. Discussion

Site Conditions and Treatment Processes

Process water-land application permits issued by the Department allow the facility to operate a land treatment system within prescribed constituent and hydraulic loading constraints and with appropriate environmental monitoring and reporting.

This wastewater-land application treatment system differs from others in the region since no food processing (other than washing and conveyance) takes place in the plant. Therefore, wastewater is relatively low strength and somewhat smaller volumes are generated. Generally, projected wastewater constituent and hydraulic loading rates are below established guidelines and site characteristics are favorable for slow rate land application.

The “Site Characterization and Management Plan (Management Plan) along with the “Operations Plan for Land Application of Potato Fresh Pack Wash Water on Crops” (PO), with the addendum dated November 5, 2003, provide a comprehensive description of the wastewater-land application facility and planned activity. The Plan describes the characteristics and proposed management of an irrigated pasture area recently purchased by Wada Farms for use an additional wastewater-land treatment area. The pasture is located adjacent to the existing, previously permitted site. The pasture can be irrigated with the same center pivot that irrigates part of the permitted site. The pasture will be improved to allow grass to be harvested, either as hay or hay silage.

Adding the pasture to the system imparts significant benefits. The additional acreage will allow reduced hydraulic and constituent loading across the system. Operational flexibility is enhanced and the Permittee will be able to distribute wastewater equally to other management units as necessary. Including the irrigated pasture in the permit also resolves permit non-compliance issues that have occurred since 1999.

The Permittee is required to conduct land application and irrigation in a manner to meet but not exceed crop water and nutrient requirements. The water holding capacity (WHC) of the soil column will be used to store water during the non-growing season at rates not to exceed guidelines. During the growing season, crop irrigation water requirements will be used to estimate hydraulic loading.

#LA-000171-02 imposes the following limitations on the operation of this process water-land application system.

Table A Site-Specific Permit Conditions (Excerpted from Table F-1 - #LA-000171-02)

PERMIT CONDITION	PERMIT REQUIREMENT/DESCRIPTION
Growing Season Maximum Wastewater Hydraulic Loading (Sum of WW + SIW)	HLR_{GS} = Irrigation Water Requirement (IWR). See Definitions. Hydraulic applications shall generally follow consumptive use rates for the crop throughout the growing season.
Non- Growing Season Maximum Wastewater Hydraulic Loading	HLR_{NGS} = $(AWC + E - PPT_{NGS}) + LR$. See Appendix 2 for additional information on evapotranspiration and precipitation values.
Annual COD Loading	50 lb/ac-day
Annual Nitrogen Loading	150% of typical crop uptake

The Permittee's proposed wastewater loading rates do not exceed irrigation water requirements; crop needs must be met by the use of supplemental irrigation water during the growing season. The Department's expectation is that the Permittee will ensure adequate supplies of supplemental irrigation water are available to meet crop water requirements. The Permittee is strongly urged to plan for an alternative source of supplemental irrigation water in the event canal supplies become limited.

With respect to NGS hydraulic loading, Wada Farms' proposed loading rates are significantly less than would otherwise be allowed using guideline methodology for establishing permit limits (see Table B).

Table B Permittee proposed hydraulic loading compared to guideline derived permit limits

WLAP Serial Number	Wada Farms Identifier	Permittee Proposed Hydraulic Loading		Guideline-based NGS Hydraulic Loading Limit (ac-in) ¹
		GS Hydraulic Loading— (compare to crop irrigation water requirement) (ac-in) ²	NGS Hydraulic Loading (ac-in)	
MU-017101	Center Pivot	6.9	8.7	10.4
MU-017102	Hand Lines	3.1	0	11.1
MU-017103	Irrigated Pasture	16.1	3.9	4.49
Typical GS Crop Irrigation Water Requirements ³ (ac-in/ac-yr) @ 75% efficiency irrigation delivery system				
Alfalfa		Pasture		Silage Corn
33.58		33.72		23.92

Staff submits that the Permittee's proposed operational configuration provides treatment capacity for proposed process water generation rates. Permit limits and environmental monitoring requirements imposed in #LA-000171-02 maximize operational flexibility while minimizing the potential for negative impacts to human health or the environment.

Soils: Description, Data Evaluation, Monitoring

Soil characteristics on Wada Farms land treatment sites have been investigated and reported in the course of prior permit application and compliance activity processes. On-site soils generally consist of well-drained loam, silt-loam or silt soils with depths ranging from 12 inches to greater than 60 inches. Analytical data consistently indicates that on-site soils are suitable for continued use as treatment media to receive process water for beneficial nutrient recycling. Soil from excavations was evaluated for color, texture, consistency, rooting depth, and soil layering. Soil infiltration rates were estimated from published National Resources Conservation Service (NRCS) data. Soil chemical qualities are generally within acceptable and characteristic ranges for productive agricultural soils.

Staff submits that soils across the three management units are generally well suited to function as process water treatment media if the Permittee operates the process water-land application system in accordance with recommendations in site characterization and management documents and with terms and conditions in #LA-000171-02.

Ground Water Quality Monitoring

¹ Calculated using the formula -- $HLR_{NGS} = AWC_{acreage\ weighted} + Crop\ ET - PPT$

² The permit limits the *cumulative* GS hydraulic application (any combination of wastewater and supplemental irrigation water) to the crop irrigation water requirement. There is no incentive to over-apply supplemental irrigation water during the GS.

³ Crop consumptive use data from: Allen, R.G. and Brockway, C.E. University of Idaho, August. (1983). Estimating Consumptive Irrigation Requirements for Crops in Idaho.

As part of the Annual Report for the years 1997 through 2000 Cascade Earth Sciences (CES), on behalf of Wada Farms, submitted a mixing zone analysis (MZA) for total dissolved solids (CES 2001). Site specific information was not available; therefore the assessment used estimates of aquifer characteristics and limited total dissolved solids (TDS) concentration data.

Using the formula: $C_{mix} = (C_{sw} * V_{sw} + V_{gw}) / (V_{sw} + V_{gw})$, where:

C_{mix} = predicted ground water concentration of TDS

C_{sw} = TDS concentration in soil water

C_{gw} = TDS concentration in ground water

V_{sw} = volume of soil water, and

V_{gw} = volume of ground water

Section 5. in the 1997 "Site Characterization and Management Plan" submitted by CES (CES 1997) listed the following estimated aquifer characteristics;

aquifer porosity of 30%,

aquifer conductivity of 9,504 ft/day,

ground water gradient of 10 ft/mile (0.002 ft/ft),

aquifer mixing zone thickness of 5 feet,

ambient ground water quality of 287 mg/L for TDS, and

mixing zone width is diameter of center pivot area, or 2,220 feet,

soil water TDS concentrations ranging from background (287 mg/L) to 2112 mg/L.

Figure 1 reproduces data from the MZA included in the 2000 Annual Report⁴. The mixing zone analysis conducted by CES in 2001 suggests that ground water TDS concentrations at the downgradient boundary could increase from 287 mg/L (approximate ambient condition) to 480-490 mg/L due to wastewater-land application activities. This represents a change in TDS concentration of 203 mg/L (71% increase).

To validate CES's conclusion that TDS concentrations might increase, DEQ repeated the mixing zone analysis using data provided in the more recent "Site Characterization & Management Plan", specifically the average soil water percolate concentration of 521 mg/L was used rather than the uncharacteristically high value of 2112 mg/L. Figure 2 shows those results and suggests that even under more conservative assumptions, Wada Farms wastewater-land application activities might increase downgradient TDS concentrations by 20% (from 287 mg/L to 344 mg/L).

⁴ It appears there are errors in the MZA included in the 2001 annual report. The CES analysis yielded a ground water time of travel of approximately 4 months. Figure 1 shows a corrected value of 1.2 months, otherwise using the same baseline values as were suggested by CES.

Figure 1 Analysis Mixing Zone Analysis (from CES 2001)

Darcy Flux					
	Data Inputs	Units	Data Source		
aquifer porosity	30%	%	from CES Mixing Zone Analysis August 2001		
aquifer conductivity	-9,504.00	ft/day	from CES Mixing Zone Analysis August 2001		
groundwater gradient	0.002	ft/ft	from CES Mixing Zone Analysis August 2001		
mixing zone length (length of travel)	2,220.00		from CES Mixing Zone Analysis August 2001		
aquifer mixing zone thickness	5.00	ft	from CES Mixing Zone Analysis August 2001		
mixing zone width	2,220.00	ft	from CES Mixing Zone Analysis August 2001		
Hydraulic Application (inches)	3.80	inches	from CES Mixing Zone Analysis August 2001		
Area of Application	67	acres	from CES Mixing Zone Analysis August 2001		
Qp = concentration of constituent in percolate (mg/L)	2112	mg/L	from CES Mixing Zone Analysis August 2001		
Cgw = concentration of constituent in ground water (mg/L)	287	mg/L	from CES Mixing Zone Analysis August 2001		
Q (Darcy Flux)	199,800	cubic feet/day			
Velocity from Q (Darcy Flux)	60.0	ft/day			
Travel Time under site	37.0	days			
Travel Time under site	12	months			
Vgw during travel time	7,392,600.0	cubic feet			
Vgw during travel time	55,300,470.0	gallons			
Vgw during travel time	169.7	acre-feet			
Other travel time or calculations					
Mixing Zone Analysis					
Qp = flow of percolate (gallons)	6,912,390	gallons			
Qp = flow of percolate (L)	26,166,244	Liters			
Qgw = flow of ground water (gallons)	55,300,470	gallons			
Qgw = flow of ground water (L)	209,335,063	Liters			
Cmix = concentration of constituent in mixture (mg/L)	490	mg/L			
Change in Cmix	203	mg/L			
% Change	71%				

Figure 2 DEQ Mixing Zone Analysis

Darcy Flux					
	Data Inputs	Units	Data Source		
aquifer porosity	30%	%	from CES Mixing Zone Analysis August 2001		
aquifer conductivity	-9,504.00	ft/day	from CES Mixing Zone Analysis August 2001		
groundwater gradient	-0.002	ft/ft	from CES Mixing Zone Analysis August 2001		
mixing zone length (length of travel)	3,200.00		from DEQ ArcView GIS project "Wada Farms.apr"		
aquifer mixing zone thickness	5.00	ft	from CES Mixing Zone Analysis August 2001		
mixing zone width	3,886.00	ft	from DEQ ArcView GIS project "Wada Farms.apr"		
Hydraulic Application (inches)	11.90	inches	from "Site Characterization and Management Plan 2003 (CES)"		
Area of Application	138	acres	from "Site Characterization and Management Plan 2003 (CES)"		
Cp = concentration of constituent in percolate (mg/L)	521	mg/L	from "Site Characterization and Management Plan 2003 (CES)"		
Cgw = concentration of constituent in ground water (mg/L)	287	mg/L	from CES Mixing Zone Analysis submitted in August 2001		
Q (Darcy Flux)	-349,740	cubic feet/day			
Velocity from Q (Darcy Flux)	-600	ft/day			
Travel Time under site	-533	days			
Travel Time under site	-18	months			
Vg during travel time	18,652,800.0	cubic feet			
Vg during travel time	18,532,587.5	gallons			
Vg during travel time	4282	acre-feet			
Other travel time or calculations					
Mixing Zone Analysis					
Qp = flow of percolate (gallons)	44,585,730	gallons			
Qp = flow of percolate (L)	168,775,357	Liters			
Qgw = flow of ground water (gallons)	18,532,587	gallons			
Qgw = flow of ground water (L)	528,188,331	Liters			
Cmix = concentration of constituent in mixture (mg/L)	344	mg/L			
Change in Cmix	57	mg/L			
% Change	20%				

As early as the 2000 growing season, Wada Farms began applying wastewater to the “irrigated pasture” west of and contiguous to MU-0017101, even though it was not permitted in #LA-000171-01.

The Management Plan estimates the following applications were made to the irrigated pasture prior to permitting:

Table C Estimated Hydraulic Applications to Unpermitted Irrigated Pasture

Time Period	Days of Operation	Estimated Total Volume (MG)	Volume to Irrigated Pasture (MG)	Percent of Total
2000 Report Year	250	25	11.1	44%
2001 Report Year	250	25	13.6	54%
2002 Report Year	250	25	13.6	54%

In light of mixing zone analysis results, and in order to evaluate whether past practices have impacted ground water, staff believes it is important to address ground water monitoring for this wastewater-land application system. The permit requires the Permittee to undertake one of two options. The first and preferred option would be the installation of a minimum of three (3) ground water monitoring wells. As an alternative, the Permittee can provide a technical assessment based on site-specific evidence that refutes the indications of the mixing zone analysis and documents that the potential for impacts to ground water are minimal.

Nuisance Odor Management

Staff submits those provisions in #LA-000171-02, along with recommendations in site management documents will mitigate the potential for occurrence of nuisance odors.

Environmental Monitoring

The Department believes a standard suite of environmental sampling and monitoring requirements are necessary to assess the performance of the land application operation and assure that the land use practice does not adversely impact natural resources or public health. #LA-000171-02 imposes typical requirements and the Permittee is expected to conduct sampling and analysis to record wastewater and ground water quality, the quantity and quality of crop uptake, soil health and productivity.

Compliance Requirements

#LA-000171-02 includes five (5) compliance requirements staff believes are necessary to ensure the safe and efficient operation of this process water-land application system.

CA-0171-01 and CA-0171-02 require that the various management plans – Operations Plan, Odor Management Plan, Buffer Zone Plan, and Waste Solids Management Plan – are updated to reflect the addition of the irrigated pasture as a permitted hydraulic management unit.

CA-0171-03 requires a Sampling & Analysis Plan (SAP) to provide a comprehensive description of environmental sampling and analysis procedures and related quality control/quality assurance provisions.

The permit explicitly allows that the various management plans, including the SAP may be combined into the Plan of Operation if desired.

CA-0171-04, Part 1, calls for a work plan for and installation of a ground water monitoring network. As an alternative to the installation of ground water monitoring wells, Part 2 requires an evaluation that certifies there is minimal potential for migration of constituents from any HMU to the uppermost aquifer during the active life of the unit.

The evaluation must demonstrate that degradation of ground water quality for constituents of concern as a result of the wastewater-land application activity is very unlikely. Based on program guidance, the Department's expectation, for regulated constituents, is that downgradient concentrations will not exceed upgradient (background) concentrations by more than 110%. The demonstration must be certified by a qualified ground water scientist and must be based upon site specific empirical data and contaminant fate and transport predictions *in the context of wastewater characteristics and site management scenarios*.

CA-0171-05, at the end of the five year permit cycle, requires the Permittee to conduct a seepage loss evaluation of the mixing pond used to store and mix wastewater and supplemental irrigation water.

4. Conclusions and Recommendations

Based on the preceding discussion, and following an evaluation of materials submitted by Wada Farms Potatoes, Inc. in application for re-issuance of WLAP #LA-000171, staff recommends that #LA-000171-02 is issued as attached.

Attachments: WLAP #LA-00031-03 ***Draft Copy***

CC: Rick Huddleston, Wastewater Program Manager, State Office
Bryan Wada, Chief Operations Officer, Wada Farms Potatoes, Inc.

Route file copy to :John Kirkpatrick, Engineering Manager

File: Bingham County, WLAP #LA-000171-02, Correspondence 2005

List of References

Allen, R.G. and Brockway, C.E. 1983. University of Idaho. Estimating Consumptive Irrigation Requirements for Crops in Idaho. Web Site: <http://www.kimberly.uidaho.edu/water/appndxet/index.shtml>

CES, 2001. Environmental Site Performance report of a Wastewater-Land Application Site, Wada Farms Potatoes, Inc. Fresh Pack Potato Operation, Pingree Idaho".

CES, 2002. TDS Mixing Zone Analysis. Submitted to IDEQ in behalf of Wada Farms Potatoes, Inc. March 26, 2002.

CES, 2003. Site Characterization and Management Plan. Submitted to IDEQ on June 11, 2003 in behalf of Wada Farms Potatoes, Inc.

CES, 2003. Operations Plan for Land Application Potato Fresh Pack Wash Water on Crops. Submitted to IDEQ on June 11, 2003 in behalf of Wada Farms Potatoes, Inc.

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